

# PATENT SPECIFICATION

1,091,005

DRAWINGS ATTACHED.

Inventor:—JOHN EDWARD OWENS

1,091,005



Date of filing Complete Specification: Aug. 23, 1966.

Application Date: July 13, 1965. No. 29567/65.

Complete Specification Published: Nov. 15, 1967.

© Crown Copyright 1967.

Index at Acceptance:—A3 V(1A5C, 2A, 5J, 5P, 6A4, 7A1, 7B4).  
Int. CL:—A 41 d 13/00.

## COMPLETE SPECIFICATION.

### Improvements in or relating to Inflatable Garments.

We, FRANKENSTEIN GROUP LIMITED, a British Company, of Victoria Rubber Works, Newton Heath, Manchester, 10, do hereby declare the invention, for which we

5 pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to inflatable garments of the type incorporating a system of bladders adapted to be filled with a gaseous fluid and thereby to exert pressure over predetermined areas of the wearer's body.

10 15 Such garments are usually described as "partial-pressure" to distinguish them from "full-pressure" suits having the gaseous inflating medium contained between the suit and the wearer's person, which must therefore be completely enclosed or at least gripped in a substantially fluid-tight manner wherever it emerges from the suit.

20 25 Partial-pressure suits are normally worn by the occupants of military aircraft operating at high altitudes, for protection against the harmful effects of low ambient pressure should the aircraft's internal pressurization system fail or be damaged by enemy action, the supply of inflating medium (usually oxygen) being controlled by a pressure-sensitive valve.

30 35 It is desirable for the occupant of a fighter aircraft also to be protected against the physiological effects of accelerations greater than that of gravity in the course of high-speed manoeuvres. Known 'anti-G' garments are likewise provided with a built-in system of bladders designed, when in use, to constrict the lower part of his body and thereby prevent "blacking-out" by resisting the flow of blood from the wearer's head under centrifugal force.

At the present time, it is customary for 45 aircrew operating at high altitudes to wear sleeved partial-pressure jerkins, which are supplemented, in the case of fighter pilots, by "anti-G" garments to provide inflatable coverage for the whole body.

Since, however, air inflation of the "anti-G" bladder system is necessarily controlled by a gravity-sensitive valve, failure of or damage to the aircraft's internal pressurisation system during normal flights at high altitudes will leave the wearer without protection for the lower half of his body unless the "anti-G" inflation system is controlled by a dual-purpose valve which will respond, not only to acceleration forces, but also to the air pressure in the aircraft. Such valves are complicated, expensive and not 50 55 normally provided on foreign aircraft.

The object of the present invention is to 60 65 obviate the abovementioned drawbacks of the partial-pressure and "anti-G" garments at present available, and to facilitate the wearing of such protective equipment in conjunction with parachute harness, life-jackets and the like.

According to this invention, we provide 70 75 appropriate partial-pressure and "anti-G" coverage by means of two independent and separately-controlled bladder systems built into a one-piece suit, the partial-pressure bladder system being applied to all areas of such suit except the inner sides of the sleeves, the seat portion and the knee regions, and having the "anti-G" bladder system superimposed thereon over the lower half of the body.

In the accompanying drawings: 80

Fig. 1 is a front view of a suit embodying the present invention.  
Fig. 2 is a rear view thereof.

BEST AVAILABLE COPY

Fig. 3 is a side elevation, and Figs. 4 and 5 are enlarged sections on the lines 4-4 and 5-5 respectively of Fig. 1.

5 In the example illustrated, the suit is made up from suitably shaped panels of nylon or polyethylene terephthalate fabric with its sleeves attached only at the upper parts of the suit shoulders, the resultant under-arm gaps being filled in with elasticated gussets A.

10 Enclosed lacing sections B are provided down the sides and legs of the suit so that the latter can be adjusted to the size of the wearer around the torso, thighs and shins, the legs of the garment having slide-fasteners C up their inner sides and suitable fullness at knee level, as well as at the crotch, for ease of wear in a sitting position.

15 20 The front and back of the suit are respectively inflatable by means of intercommunicating bladders D, E contained between inner and outer fabric layers F, G and adapted to be fed with oxygen through an inlet H at the centre of the chest.

25 The front bladder D is necessarily formed in two sections at opposite sides of a slide-fastener closure I which extends from the neck opening J to the left hip of the garment, but also communicates with two other bladders K which extend around the whole of each leg except for an area L at the front, back and inner side of the knee. The back bladder E, however, terminates at waist level, the seat portion M of the garment being uninflatable.

30 35 At the top of each shoulder the bladders D, E communicate with the narrowed end of a still further built-in bladder N which extends over the outer side of the adjacent sleeve but is 'waisted' at the elbow region. The inner side of the sleeve, and of course, the underarm gusset A, is uninflatable, a short slide-fastener O being provided at the cuff.

40 45 It will be appreciated that, owing to the disposition of the various bladders, inflation of the suit in no way hampers the wearer in sitting down or in moving his arms and legs.

50 55 The "anti-G" protection takes the form of a separate bladder P partly overlying the front bladder D aforesaid and enclosed in a pocket Q sewn inside the outer skin G of the garment, being so arranged as to compress the wearer's abdomen when inflated by air pressure through a tube R at one side.

60 65 This bladder P communicates, at each hip region at the garment, with the narrowed upper end of a similarly pocketed bladder S which extends down the outer side of the adjacent suit leg and corresponds generally

in shape to one of the sleeve bladders N, being 'waisted' at knee level.

65 70 It will be appreciated that the effect of the bladders P, S, when inflated, is to tighten the suit fabric about the wearer's body, the pressure thus applied being, of course, supplementary to that obtained by inflation of the partial-pressure bladders in the lower half of the suit.

75 80 The abdomen-covering bladder P surrounds a transverse slit, provided for urination purposes in the front of the suit and having a slide-fastener closure T, a secondary bladder U, which communicates with the bladder D at both ends, being provided across the inner side of the urination slit to ensure continuity of pressurization under normal conditions.

85 The combined partial-pressure and "anti-G" suit above described is intended to be worn under a flying overall or immersion suit, together with additional equipment (e.g. a parachute pack or lifejacket).

#### WHAT WE CLAIM IS:—

1. An inflatable garment of the type referred to, characterised in that appropriate partial-pressure and "anti-G" coverage is provided by means of two independent and separately-controlled bladder systems built into a one-piece suit, the partial-pressure bladder system being applied to all areas of such suit except the inner sides of the sleeves, the seat portion and the knee regions, and having the "anti-G" bladder system superimposed thereon over the lower half of the body.

90 100 2. An inflatable garment according to Claim 1, further characterised in that the non-inflatable sleeve portions include under-arm gussets of elasticated material.

105 3. An inflatable garment according to either of the preceding claims, further characterised in that the "anti-G" bladder system covers the abdomen and the outer sides of the legs and is confined in pockets united to the outer skin of the garment.

110 115 4. An inflatable garment according to Claim 1 or Claim 3, further characterised in that each sleeve portion of the partial-pressure system or each leg portion of the "anti-G" system is narrowed at its junction with the main bladder or bladders of the system concerned and is waisted midway of its length so as not to impede elbow or knee movement as the case may be.

120 125 5. An inflatable garment according to any one of the preceding Claims and having a closable urination opening at the crotch region, further characterised in that said opening is covered internally of the suit by a subsidiary bladder connected at its ends to the adjacent part of the partial-pressure system.

6. An inflatable garment according to  
Claim 1, substantially as herein described  
with reference to, and as shown in, the  
accompanying drawings.

For the Applicants:—  
WILSON, GUNN & ELLIS,  
Chartered Patent Agents,  
57, Market Street, Manchester, 1.

Abingdon: Printed for Her Majesty's Stationery Office, by Burgess & Son (Abingdon), Ltd.—1967.  
Published at The Patent Office, 25 Southampton Buildings, London, W.C.2,  
from which copies may be obtained.

**BEST AVAILABLE COPY**

109106 COMPLETE SPECIFICATION  
2 SHEETS This drawing is a reproduction of  
the Original on a reduced scale  
Sheets 1 & 2

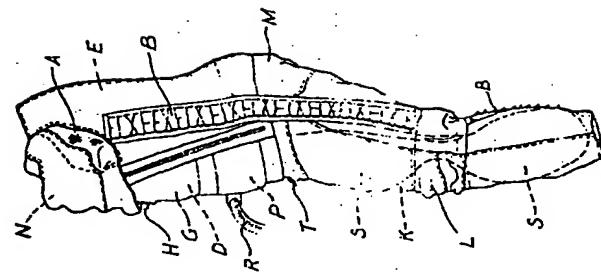


FIG. 3.

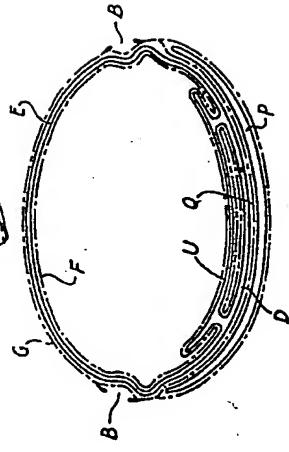


FIG. 4.

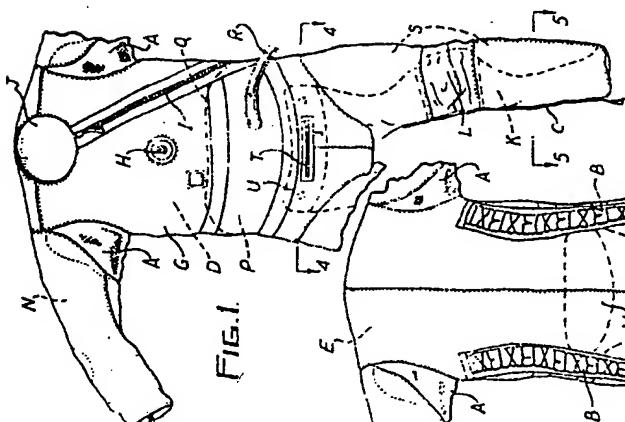


FIG. 1.

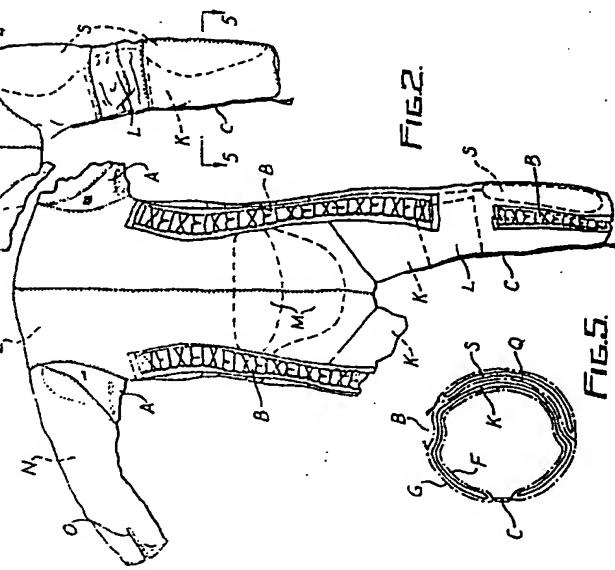


FIG. 2.

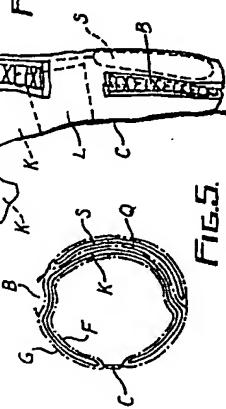


FIG. 5.

BEST AVAILABLE COPY